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MENISPERMUM CANADENSE.

By Harry Lee Barber, Ph.G.

From an Inaugural Essay.

The rhizome examined upon transverse section showed the thickness of the bark to be one-sixteenth the diameter, in some specimens even less. It is formed of two irregular layers, the inner one (liber) being about twice the thickness of the outer covering, and consisting of roundish or lengthened cells of parenchyma, and the elongated bast fibres. The outer layer is entirely parenchyma. The medullary rays are in the shape of an elongated wedge, curved at the pith, and united at the top by a circular zone of polyhedral parenchyma tissue pale brown in color, and separated from the liber by a darker line. The rays are about equal in width to the wood wedges, and are about fourteen in number, but varied from twelve to twenty-six. The pith is about one-fifth the whole diameter, and consists entirely of polyhedral parenchyma. The wood wedges are semicircular on the outer extremity, being capped by a tissue having a semi-lunar form; they consist of ducts and pleurenchyma, and are invariably truncated and tapering towards the centre. The overground stem consists of about one-half pith. The bark is in two layers, structure similar to the rhizome, but the layers proportionately thinner. The wood wedges are oval, being separated by narrow medullary rays, and the cells of the medulla are large and polyhedral.

Analysis.—None of the constituents were soluble in benzin with the exception of a very minute quantity of two yellowish, resinous bodies, one of which was lighter in color, and soluble in ether. No fatty material was dissolved by the action of the benzin.

The ether percolate evaporated left a brownish yellow, soft, resinous mass. This was entirely soluble in alcohol, partially so in water. The residue from this aqueous solution dissolves entirely in chloroform and benzin, and has all the characteristics of a resin. It is tasteless, inodorous, hard and brittle, brownish in color, and corresponds to the soluble resin of the benzin operation. The aqueous solution responded to the general alkaloidal tests. A tannin (menispermo-tannic acid)

was also found in this, giving, with test solution of ferric chloride, a dark green color.

The ground rhizome was next heated to about 40°C. to expel the ether, and was then percolated with 94 per cent. alcohol. This on evaporation also gave a resinous residue, yellowish brown in color, slightly soluble in ether and partially so in water, a brown resin remaining. Hydrochloric acid was added to this aqueous solution, a yellowish precipitate being thrown down, which was soluble in hot alcohol, and answered all the tests for hydrochlorate of berberine.

On the addition of carbonate of sodium to the mother liquor from the berberine precipitate, a grayish white powder was thrown down, which reacted with various group tests for alkaloids (see "Amer. Jour. Phar.," 1863, p. 302). The precipitate was dissolved in hydrochloric acid, and filtered through animal charcoal. Ammonia was added to the solution, producing a precipitate which on being shaken thoroughly with ether dissolved. This etherial solution was evaporated, the residue being dissolved in water acidulated with HCl., this solution again being precipitated. The above process was repeated several times, in order to attain the highest degree of purity. The alkaloid was at length procured in the form of a whitish, amorphous powder.

The aqueous percolate of the rhizome gave alkaloidal precipitates, and green ones with ferric chloride, showing presence of the tannin before mentioned.

The percolate with diluted hydrochloric acid gave, with ammonia and general group reagents, alkaloidal reactions corresponding to the previous tests, some coloring matter, and a small quantity of pectin.

The ammoniacal percolate gave no evidence of alkaloidal presence, but a large amount of coloring matter was extracted, the color of this percolate being much darker than any of the preceding ones. Nothing important was found in this operation.

The decoction was concentrated. This gave on addition of absolute alcohol, a flocculent precipitate of gummy matter. Test solution of iodine yielded a bluish coloration indicating starch. Test solution of iodohydrargyrate of potassium gave here slight evidences of alkaloidal reaction.

On distilling the rhizome with water, a milky-white liquid resulted, separating after long standing, a very minute portion of volatile oil which was colorless, and aromatic, the odor resembling that of oil of erigeron.

Carefully heating the powdered rhizome, without charring, at or near 100°C., the moisture was found to be 3·2 per cent. On incineration it yielded 7·07 per cent. of ash containing K., Ca., Mg. and Si., with traces of Fe.

The second alkaloid[1] obtained from the rhizome was in the form of a whitish amorphous powder, gradually becoming darker on exposure to the air and light; when first precipitated it was supposed to be either oxyacanthine or menispermine. Solutions of the alkaloid were made containing one part in one hundred, in two hundred and fifty, in five hundred, in seven hundred and fifty, and in one thousand parts. These five degrees of strength were taken that the exact limit of precipitation and sensitiveness could be ascertained. The behavior of oxyacanthine is that described by Mr. H. B. Parsons.

	Oxyacanthine.	Menispermine.	Menispine.
Color	White, yell. on expos.	White, yell. on expos.	White, yell. on expos.
Taste	Bitter.	Tasteless, entirely.	Very bitter.
Water	Nearly insoluble.	Insoluble.	1 part in 75.
Alcohol, abs.	Soluble.	1 part in 200.	Very soluble.
Alcohol, com.	1 part in 30.	1 part in 200.	1 part in 6.
Ether	1 part in 125.	1 part in 60.	1 part in 40.
Chloroform	Freely soluble.	1 part in 170.	1 part in 20.
Benzol	Soluble.	1 part in 200.	Insoluble.
Ammonia	Sparingly soluble.	Insoluble.	Insoluble.
Sol. Soda	Moderately soluble.	Insoluble.	Insoluble.
Sol. Soda Carb.	Nearly insoluble.	Insoluble.	Insoluble.

It will be noticed that the alkaloid resembles oxyacanthine in color and influence of air. The bitter taste was distinctly noticeable in a solution of one part in fifteen hundred; it is to be remarked in this connection, that it was not nauseous, but agreeable, like that of gentian.

A marked difference in the solubilities is seen, the alkaloid being five times more soluble in alcohol than oxyacanthine, and over three times in ether. While oxyacanthine is more or less soluble in ammonia, solution of soda, and solution carbonate of sodium, the alkaloid in question is entirely insoluble in all three.

It was also noticed that menispermine was entirely insoluble in and unchanged by hydrochloric acid, but menispine is freely soluble with-

[1] We propose for this alkaloid the name of *menispine*.—Ed.

out residue. Other marked differences are that menispermine is perfectly devoid of taste, the other persistently bitter, even in very dilute solutions. Menispermine is insoluble in water, and barely soluble in excess of alcohol and chloroform.

The following experiments prove, in the opinion of the writer, the alkaloid to be distinct from either oxyacanthine or menispermine. The solutions used in this case were in alcohol, 94 per cent., the strengths being one part in two hundred. The reactions of the white alkaloid of Menispermum canadense are identical in both water and alcohol; the table given by the author describing the precipitates obtained from the weaker solutions as being of a paler color, but as being distinctly observable in a $\frac{1}{1000}$ solution, the reactions with potassio-mercuric iodide, phospho-molybdic acid and tannin being faintest. Menispermine was examined at the suggestion of Prof. Maisch, to whom the writer is indebted for the sample used in the experimentation.

	Menispermine.	Oxyacanthine.	Menispine.
Tr. Iodine	Yellow ppt.	Dark brown red ppt.	Dark red ppt.
Iodine in KI	" "	" " "	" "
Potass. Merc. Iod	White "	Yellowish ppt.	Yellowish white ppt.
Ac. phospho-molyb.	" "	Brown ppt. insol. in but dark blue by NH_4OH	Yellow ppt. sol. in NH_4OH with't ch'nge
Potass. cadm. Iod	" "	White ppt.	Grayish ppt.
Acid, picric	Yellow "	Insol. in $HC_2H_3O_2$. Yellowish ppt.	Sol. in $HC_2H_3O_2$. Yellow ppt.
Platinic chloride	" "	Insol. in HCl. Yellowish ppt.	Insol. in HCl. Yellow ppt.
Gold chloride	" "	Insol. in HCl. Orange ppt.	Insol. in HCl. Orange ppt.
Acid, tannic	" "	Brownish ppt., insol. in $HC_2H_3O_2$ and dil. HCl.	Whitish ppt., insol. in $HC_2H_3O_2$ and dil. HCl.
Acid, sulph. conc	Yellow coloration.	Brownish purple, darker on standing.	Brown, fades on standing.
Acid, sulpho-molybdic	Yellowish "	Purple, fades slowly, becomes yellow, then green.	Brown, fades to yellow
Acid, nitric, conc	No change.	Orange red, effervesces color permanent.	Effervesces, yellow, permanent.
Zinc chloride, fused	"	Chocolate brown.	Brownish yellow.

The four last mentioned reagents were applied to the powdered alkaloids.

MENTHOL.

By Prof. Henry Trimble.

Under the name of "Peppermint Camphor," and "Solid Oil of Peppermint," menthol appears to have been known as early as 1829. Its composition and some of its properties were investigated by Dumas, Blanchet and Sell, and Walter, with the result that they closely agreed on its composition, but differed widely concerning the fusing point. These investigations were on the camphor from American peppermint, and they all agreed on the formula $C_{10}H_{20}O$, while the fusing point varied from 25°C. to 36·5°C., boiling-point from 208°C. to 213°C.

In 1862 Oppenheim ("Jour. Chem. Soc.," xv, 24) described a "Solid Oil of Peppermint" from Japan, the product of Mentha arvensis, and for which he proposed the name of menthol. He stated the fusing point to be 36°C., boiling point 210°C.; and the following result in regard to composition:

Japanese.	American (Dumas).	Calculated for $C_{10}H_{20}O$.
C.....76·93	76·5	76·92
H.....13·40	13·1	12·82
O.....		10·26

Not much attention appears to have been given to this substance, until mention is made ("Am. Jour. Phar.," May, 1871) of the use of Chinese or Japanese oil of peppermint by the Chinese of California for neuralgia. Flückiger ("Pharm. Jour.," Oct., 1871), examined some of this oil and obtained menthol from it, the identity of which with the menthol from M. piperita he considered "not quite satisfactorily proved."

In 1874, Mr. John Moss "Pharm. Jour.," Nov., 1874), speaks of the arrival in London of both the solid and liquid oil from Japan. He found the fusing point of the solid oil to be 39°C., and boiling point 215°C., although it began to boil at 210°C. In 1876 Messrs. Beckett and Wright ("Jour. Chem. Soc.," xxix) examined this same menthol furnished by Mr. Moss. They first purified it by solution in weak alcohol, separation as an oil and exposure to air until crystals formed. These crystals, after several weeks' exposure to air, fused at 42°C., and boiled at 212°C. A combustion gave the following result:

	Calculated.	Found.
C.....	76·92	76·35
H	12·82	12·91

Since then menthol from Chinese or Japanese oil has rapidly gained

in popular favor, until now it may be found in a variety of forms in almost every drug store.

In the June number of this Journal is mentioned a menthol from M. piperita, for which the name "Pipmenthol" is very properly suggested, to indicate its origin, and distinguish it from that of China. There is sufficient physical difference between the two to warrant the employment of different names. The sample furnished me by Prof. Maisch has the characteristic odor of M. piperita, while the commercial menthol has a peculiar odor resembling a mixture of peppermint with other members of the mint family. The crystals are "snow-white and acicular," while those of commercial menthol are more or less transparent. Chemically the two are undoubtedly identical, as the following experiments will show.

Pipmenthol fused at 42°C.; several determinations confirmed this. The thermometer used was compared with a number of others and found to be accurate. Japanese menthol fused at 41°. Three combustions, one of pipmenthol and two of the Japanese were made with the following result:

	Calculated for $C_{10}H_{20}O$.	Pipmenthol.	Japanese. I.	Japanese. II.
C	76·92	77·14	79·63	79·33
H	12·82	12·93	13·03	12·75
O	10·26			
	100·00			

The difference in the amount of carbon in the Japanese is explained, as is the lower fusing point, by the presence of some of the liquid oil richer in carbon. This will also explain the low fusing point given by the early investigators.

As found by Beckett and Wright, menthol, after exposure to air for some weeks will have a higher fusing point, and we may suppose a lower carbon percentage. The pipmenthol as now made may properly be taken as a standard for the determination of the properties of this substance, and there is little doubt but that the Japanese article may be so purified as to resemble it in everything but odor.

Philadelphia, July 15, 1884.

FERRIC CHLORIDES.

By R. Rother.

The Pharmacopœia was never very successful in the selection and construction of its iron compounds. The tendency towards an unattainable degree of definiteness and purity was perhaps the main cause of this failure. In pharmacy excessive purity and accuracy is in most cases wholly unwarranted. Extreme concentration is another characteristic whose undesirable features are conspicuously manifested in at least two prominent directions. The one leads on to certain forms of dense solutions whose high degree of strength is inimical to permanence. The other, however, which comprises the most vicious system of the two, embodies a class of preparations whose exalted medicinal power, irrespective of physical concentration, is their principal danger. Without citing the very numerous instances so readily at hand, let the case of tincture of opium suffice. This preparation, already four times too strong for general safety, has recently had its strength augmented by 50 per cent. All of these powerful, especially liquid, compounds call for a systematic and universal dilution.

In order to reach a highly definite result and simultaneously secure a superior grade of purity, the Pharmacopœia, in its process for solution of ferric chloride, uses an excess of iron. This surplus of iron is intended to exclude contaminating metals and insure the perfect saturation of a certain quantity of acid. Since, however, a practically pure quality of iron is easily obtainable, and since the acid itself is never definite, these troublesome precautions are wholly gratuitous. To facilitate the solution of the metal under these adverse conditions the Pharmacopœia has, however, improved the process by adding water to the acid. As 100 parts of the solution shall contain 37·8 parts of ferric chloride, it must represent 13 parts of metallic iron, thus:

$$FeCl_3,\ 162{\cdot}1 : Fe,\ 55{\cdot}9 :: 37{\cdot}8 : 13{\cdot}03.$$

This amount of iron in the condition of normal ferric chloride represents 80 parts of chlorhydric acid, thus:

$$FeCl_3,\ 162{\cdot}1 : 3(HCl),\ 3 \times 36{\cdot}4 \div {\cdot}319 :: 37{\cdot}8 : 79{\cdot}82.$$

Officinally 86 parts of the acid are directed.

Now, since under ordinary circumstances 80 parts are sufficient, it follows that the 6 superfluous parts must be counted as impurity. Yet

the inference is fair that this excess is needed to prevent decomposition during the application of heat. But a portion of it is intentionally added for the presumptive generation of an ether when the liquor is compounded into tincture. As, however, this ether is considered an essential component of the tincture in whose production three months of time are given, it follows, that be the creative agent what it may, it cannot be officially viewed as an undesirable contamination. Now, the Pharmacopœia has been very solicitous to employ only nitric acid in the development of ferric salts in general and to expel any excess by means of heat. It can be easily shown that it is impossible to get rid of the nitric acid in this manner. The expulsion of the lower oxides of nitrogen is not even attainable by this method. It can be further shown that the production of the ether depends upon the presence of these oxides of nitrogen exclusively and that the chlorhydric acid has no share in the performance. To remove all doubt in this connection, the writer made three mixtures, preserved in well-stopped bottles, the first being composed of one part of chlorhydric acid and nine parts of alcohol; the second of one part of chlorhydric acid and four parts each of water and alcohol, and the third of one part of nitric acid and four parts each of water and alcohol. After months of standing the first two mixtures possessed no odor but that of alcohol. After several days' standing the third mixture had developed the unmistakable odor of ethyl nitrite and at the same time began to effervesce slightly, especially on shaking. The effervescence finally ceased, but the fragrance in the meantime had become much stronger. When solution of ferric chloride containing some nitric acid is mixed with alcohol, or either alcohol and water, a very dark, sometimes nearly black color is soon produced, and shortly after nitrogen tetroxide is copiously evolved. Eventually the fuming ceases and the color assumes a much lighter shade. However, the tint permanently remains many shades deeper than that of a similar combination free from nitric admixture. The colored product, after the main reaction is over, is always characterized by the odor of ethyl nitrite. If the very dark solution at the incipiency of the reaction is subjected to heat, a violent effusion of nitrogen tetroxide results, and the deep hue is simultaneously discharged, leaving only the normal color of ferric chloride. Incidentally during this operation the odor of nitrous ether also disappears and is not regenerated during any subsequent period of storage. It is well known that when Monsel's solution is evaporated a pasty, deliquescent residue

remains. In order to dry this perfectly a moderately high and prolonged heat is necessary. It then becomes pulverulent and unhygroscopic. Even in this condition, it long after slowly dissipates nitrous vapors. On mixing a little alcohol with the pasty residue and placing it in a warm locality it dries up to a light friable mass utterly free from nitrous compounds and deliquescent tendency. These results show that the usual methods do not prevail against the presence of nitric acid and the lower oxides of nitrogen. They, however, adduce powerful evidence that alcohol is the effective purifying agent, and that after its influence has been exerted upon the usual forms of ferric salts, developed by nitric acid, they cease to generate nitrous ether in the presence of alcohol. Under ordinary conditions nitric acid does not directly react upon alcohol and form ethyl nitrate, it is first reduced, in decomposing a part of the alcohol, to nitrous acid which then combines with the remaining alcohol and produces ethyl nitrite. When nitrous oxide, that is, nitrogen trioxide, comes in contact with alcohol, it also gives rise to ethyl nitrite. Nitrogen tetroxide in reacting upon bases effects the formation of a mixture of nitrates and nitrites and hence when alcohol slowly absorbs this gas, nitric acid and ethyl nitrite result. Nitrogen dioxide does not exert a direct effect itself, but its oxidation producing the tetroxide consequently leads to an identical product. From this it is seen that the chief factors in the development of an ether in tincture of ferric chloride are three lower oxides of nitrogen, namely, the di, tri, and tetroxide, whilst nitric acid acts but indirectly, and chlorhydric acid is wholly inert. In the "American Journal of Pharmacy" of April, 1876, p. 177, the writer has already dwelt upon similar considerations. If the Pharmacopœia insists on the method of transformation by means of nitric acid with a view to the exceptional purity of the product, it is certainly not attaining its object. To secure this end it must either purify the crude product by means of alcohol or abandon the nitric acid process. If, then, after producing, by whatever means, a compound of the desired quality, the ether-forming feature will naturally disappear. However, if this adjunct is deemed essential, it can readily be supplied by the addition of about 4 per cent. of spirit of nitrous ether. This procedure would also impart a more definite and practical character to the preparation. In regard to the official proportion of alcohol in the tincture, it may be said that it is unnecessarily great. Whilst a moderate amount, say

35 per cent., may be beneficial, any large excess may be fairly judged as a species of impurity, aside from being a positive waste.

In the "Pharmacist" for July, 1869, the writer advocated the use of potassium chlorate for the development of ferric salts. With this process a slight impurity is incurred in the form of potassium chloride. From a therapeutical aspect, as well as viewed from the side of pharmacy, this contamination is absolutely unobjectionable. Recently, however, the writer has used barium chlorate in this operation with great success. By its employment a more than practically pure product is obtained. In this new process chloric acid in moderately concentrated solution is first prepared either by dissolving the chlorate in about five times its weight of warm water and then gradually adding sulphuric acid in slight excess, but previously diluted by pouring it into about five times its weight of water. Or the sulphuric acid may first be mixed with water equal to five times the weight of the chlorate before the addition of the latter. In such cases the precipitated barium sulphate is separated by filtration through paper. It stands to reason that contact of strong sulphuric acid with the chlorate must be cautiously avoided if dangerous explosions are not to occur. Should this process become popular the chloric acid in proper form and quantity would soon be furnished by the manufacturers at appropriate prices. The writer, however, prefers to add the chlorate directly to the acidified solution of the ferrous salt and then precipitate the barium as sulphate with a slight excess of sulphuric acid, diluted or not. If any barium sulphate remains dissolved at all it is an indiscernable trace.

The term peroxidation as applied to the transformation of valence from a lower to a higher degree and perfectly appropriate in the older chemistry has now become very awkward and meaningless. A new term is highly desirable, and hence the writer proposes "valeation" as indicative of the transformation of valence. In place of the antiquated terms, deoxidation and peroxidation, the new forms, devaleation and pervaleation are properly substituted. Consequently changing the valence to a diad will be called divaleation, to a triad, trivaleation, etc. Now to effect the trivaleation of the iron in 400 parts of the official solution of ferric chloride requires 25 parts of barium chlorate, as is seen from the following proportion:

$$12(FeCl_3),\ 12(162{\cdot}1) : Ba(ClO_3)_2\ Aq.,\ 321{\cdot}6 :: 4(37{\cdot}8) : 25.$$

The amount of sulphuric acid necessary to precipitate the barium as

sulphate is 8 parts, this being a slight excess as will be noticed from the accompanying proportion:

$$Ba(ClO_3)_2\ Aq., 321{\cdot}6 : H_2SO_4, 98 \div {\cdot}96 :: 25 : 7{\cdot}94$$

Since the chlorhydric acid resulting from the decomposition of the generated barium chloride amounts to one-eighteenth of the whole, or $320 \div 18 = 17{\cdot}78$ parts, the total quantity will be 337·78 parts. Although this represents a considerable excess, the amount is still below the official quantity, which is 344 parts.

In the "Pharmacist" for July, 1872, the writer recommends a process for making tincture of iron, in which he proposed to use only the requisite amount of a practically pure metal. By avoiding an excess, a known definite amount of iron was thus incorporated. The writer also advocated the employment of all the acid at once, thereby greatly expediting the solution of the iron. On this occasion the acid was used in a diluted form. Recently, however, it was found unnecessary to dilute the acid when using the whole of it at the outset. The continual presence of a large excess acting upon a fine form of iron insures rapid solution, with uniform energy.

From these various considerations the following formula for a solution if ferric chloride is devised:

Iron, in fine wire	53 parts.
Chlorhydric acid	320 "
Barium chlorate	25 "
Sulphuric acid	8 "
Water sufficient to make	400 "

Add the iron gradually to the chlorhydric acid, and when all has dissolved add the barium chlorate, in small portions at a time, during constant stirring of the mixture. When the incorporation, solution and decomposition of this is complete, pour in the sulphuric acid, previously diluted with half its weight of water, with constant stirring, and set the mixture away, so that the barium sulphate may subside. Now decant the clear solution, and transfer the turbid portion to a filter, and add water through the filter until the decantate and filtrate together weigh 400 parts, and mix them.

The so-called basic salts of iron are of two kinds, which in many respects are so similar that very little, if any, distinction has been made between them. In many particulars, however, the difference is so important that for various practical reasons it cannot be ignored.

These classes are in the one case oxygen substitutions of the normal salts, and in the other case hydroxyl substitutions. In connection with certain non-volatile polybasic carbon acids the stability of the two kinds is equally good. But in the case of various mono-basic volatile acids, mineral or carbon, the oxygen substitutions are remarkably unstable, particularly in very concentrated or extremely dilute solutions. On the other hand, the hydroxyl salts are much more permanent, but in strong solutions are liable to change into the other class from the chemical separation of water.

Normal ferric hydrate or ferric hydroxide may be viewed as a complete hydroxyl substitution of a normal ferric salt. This compound, even in the humid state, soon loses half of its water, and is thus changed to an oxy-hydrate or hydro-oxide. On drying, the loss of water amounts to two-thirds of the whole, and the body is reduced to the form FeO(OH). The normal ferric hydrate dissolves with tolerable readiness in most acids, yielding soluble ferric salts. As the separation of water proceeds the insolubility augments, and hence the dried hydrate unites with a very limited number of acids. Owing to the comparative slowness with which the ferric hydrate obtained by precipitation with ammonia dissolves in acids, it seems likely to be even then a partial anhydrate.

In the "Pharmacist" for December, 1873, the writer called attention to the fact that a ferric hydrocarbonate, $Fe_2CO_3(OH)_4$, is obtained by pouring solution of ferric sulphate into excess of disodic carbonate. It was found that this compound, aside from various other advantages, dissolves much more rapidly and copiously in acids than the customary hydrate. More recently the writer ascertained that sodium bicarbonate is superior in a variety of aspects, and also relatively cheaper. Theoretically, 100 parts of solution of ferric sulphate require 36·22 parts of the sodium salt for precipitation, but in practice it is advisable to employ about 42 parts of it.

The so-called dialyzed iron was once wrongly supposed to be a colloidal form of ferric oxide or hydrate. It is now known to be a ferric hydrochloride, possessing a low equivalence of chlorine. It is ordinarily prepared by macerating for a considerable time a large excess of ferric hydrate in weak chlorhydric acid. In "New Remedies" for January, 1881, the writer recommended the use of ferric hydrocarbonate for this purpose, owing to its greater purity and speed of solution. The formula which was then submitted for making a solution of triferric hydrochloride, $Fe_3Cl(OH)_8$, yielded a very concentrated

preparation, which for this reason owned a disposition to generate a peculiar opacity or fluorescence and gradually deposit a sediment. On reducing it to about one-third this strength the decomposition is prevented or arrested.

The Pharmacopœia has now adopted a solution of normal ferric acetate, which will probably be more stable than the concentrated and basic compounds elsewhere in use. In view of the fact that the volatile acetic acid does not supply a desideratum in the range of these compounds, the writer experimented with lactic acid. It was then found that no soluble hydro-salt could be formed by it, at least with the use of ferric hydrocarbonate.

On the addition of a very small proportion of chlorhydric acid solution resulted at once in the production of a deep brown basic compound. By varying the relative amounts of the chlorhydric and lactic acids within certain limits a large number of these compounds can be formed. The writer, however, prefers to unite them in such proportion that the chlorhydric acid shall constitute one-third of the acid content, and that these combined shall be one-third of the normal equivalence. In this manner a hydro-salt is obtained whose amount when dried in scales is in close accord with the molecular formula synthetically constructed and represented by the expression $Fe_3ClLc_2(OH)_6$, with a molecular weight of 483·4.

This ought to be a valuable substance, for therapeutical reasons, and might in this connection replace quite a number of less adaptable compounds. It is in so far superior to dialyzed iron that it can be prepared in a solid, soluble form, and exhibited in any strength of solution. The metallic flavor is almost if not wholly absent. It has an agreeable, sweetish, slightly astringent and mildly acidulous taste. The salt can readily be obtained in scales which are slightly deliquescent in a humid atmosphere, but otherwise permanent and promptly and completely soluble. The solution is remarkable for the fact that moderate temperatures do not disturb it, but boiling it a short time causes a profuse non-gelatinous precipitate, which promptly redissolves on cooling. The process for preparing it in a definite solution as well as in scales is as follows:

Solution of ferric sulphate	2,085 parts.
Sodium bicarbonate	850 "
Lactic acid	240 "
Diluted chlorhydric acid	364 "
Water sufficient to make	2,085 "

Mix the solution of ferric sulphate with 4,000 parts of water and gradually add it to the sodium bicarbonate (contained in a capacious capsule) with constant stirring. Now apply heat until effervescence has nearly ceased; dilute the mixture with 40,000 parts of water, and let the precipitate subside. Decant the supernatant liquid and treat the remainder twice more with the same amount of water and decant as before. Now pour the washed precipitate upon a filter, and when the excess of adhering water has drained off transfer it to a capsule and mix it with the lactic acid; then add the diluted chlorhydric acid, warm gently, and when the precipitate has dissolved add sufficient water to make the solution weigh 2,085 parts. To obtain the salt in scales evaporate the solution gently to a syrupy consistence and spread it out on plates of glass to dry.

THERMO-CHEMISTRY OF HALOÏD SALTS.

By Berthelot.

In a series of eight papers the author, by adducing the data for the application of his general theory to the case of the double haloïd salts, adds a new chapter to the researches on chemical mechanics which he has pursued for so many years. A complete theory of saline reactions requires that *all* the compounds capable of being formed under the given conditions of the experiment shall be taken into account. Thus, the heats of formation and of dissociation, not only of the simple salts, but those also of all the acid, the basic, the double, the hydrated, and the anhydrous salts that can possibly be formed under the circumstances, must be determined beforehand. This has been done in many cases in the present series of papers, and the observed reactions explained by the principle of maximum work, as in the theory of chemical equilibrium already advanced in the author's *Essai de Mécanique chimique.* The first paper merely states the range of the investigation. The second gives the thermal data for double salts formed of mercury, of potassium, or of both, united with one or two of the three halogens, chlorine, bromine, iodine, or with their analogue, cyanogen. Some interesting particulars are noted concerning the successive physical and chemical changes of such salts. Thus, the heat of combination from the simple salts is very small, except when the iodide is one component, when the heat, reckoned from the yellow iodide, is about the same as that disengaged in the transforma-

tion of yellow to red iodide. The combination of potassium iodide with mercuric cyanide liberates much heat, and the author regards the resulting product as a triple salt formed by a union of mercuric iodide with a double cyanide of mercury and potassium.

In the third paper, it is shown that haloïd salts of mercury, like those of other metals, combine with their corresponding hydracids, forming well-defined, crystallised acid salts. Red crystallised mercuric iodide dissolves readily in dilute hydriodic acid with disengagement of heat, and there is evidence of the stability of the compound thus formed, which may be regarded as mercuro-hydriodic acid, corresponding with a whole series of double salts, and analogous to the well-known complex acids derived from metallic cyanides. The heat of formation of acid chloride of mercury is less than that of the acid bromide, and much less than that of the acid iodide, whilst mercuric cyanide disengages scarcely any appreciable heat with hydrocyanic acid. The next paper treats of the heat of neutralization of hydracids by the oxides of mercury and of potassium.

In the fifth paper are discussed the isomeric states of the haloïd salts. The heat of transformation of 227 grams yellow mercuric iodide into red is 1·5 cal. In the formation of silver iodide by precipitation with potassium iodide, a succession of transformations occur in the amorphous state of the substance, and its passage from the last amorphous condition to the crystalline is not accompanied by any sensible thermic phenomenon, that is to say, the sum of the work done in the transformation is sensibly *nil*. The same thing happens when an organic substance passes into an isomeride of the same chemical functions. But when there is a change of condensation (polymerization), or a change of chemical function with the same condensation, a notable disengagement of heat is usually observed.

The sixth paper is devoted to a study of the double decompositions of the haloïd salts of mercury, and the numerical results confirm in all respects the author's principles. In all cases, the system which disengages the most heat is formed by preference whether as regards dissolved or insoluble substances, and Berthollet's laws are sometimes verified and sometimes quite contradicted, just as they are or are not in accordance with the thermochemical previsions.

The seventh and eighth papers deal with the haloïd salts of silver, in the reactions of which there are certain special distinctive circumstances, such as the inverse displacements to which attention has lately

been called. The author explains these by the formation of a double salt and the consequent separation of the alkaline salt along with the haloïd salt in the solid form. The displacement of hydrochloric acid united to silver, by hydrobromic and hydriodic acids, whether free or combined with alkalis, takes place by reason of the thermic preponderance of these last acids, and would exclusively take place but for the existence of double and acid salts capable of giving rise to inverse reactions, which however are limited by the dissociation of the double salts. And with the silver salts, as with the mercuric, the whole resolves itself into one fundamental action, namely, that which corresponds with the thermic maximum.—*Jour. Chem. Soc.*, 1884, p. 656; *Ann. Chim. Phys.*, [5], 29, p. 198–288.

THE "DROP" METHOD OF CHEMICAL ANALYSIS.

By Dr. H Hager.

The customary methods for testing medicinal agents, which are both tedious and require a larger quantity of material, can be superseded by a method which requires merely single drops of the reagent, as well as of the liquid to be examined. For this method the following reagents are needed:—

Red and blue litmus paper and turmeric paper.

Extract of indigo paper, which is turned yellow by hot nitric acid and caustic alkalies, but not by ammonia.

Rosaniline paper as a test for alcohol.

Potassium ferrocyanide paper as a reagent for ferric salts (blue), copper and uranium (deep brown), gold (greenish brown), platinum (brownish green to reddish), thallium and vanadic acid (yellow).

Potassium sulphocyanide paper is turned decidedly yellow by bismuth nitrate, bluish black by salts of copper, red by solution of gold, white by mercuric nitrate, black by mercurous nitrate, and blood-red by ferric salts.

Potassium iodide paper is turned red by mercuric salts, green by mercurous salts, yellow by solution of lead. For detecting chlorates 2 to 3 cc. of the liquid are placed in a small test-tube along with a slip of the paper; 1 cc. of dilute sulphuric acid is then added, and heat is applied. If chlorate is present the liquid turns yellow.

Mercurous nitrate paper serves when moistened to detect ammonical

gas, which turns it black; caustic alkalies and alkaline mono-carbonates stain it greenish-brown to black, whilst the alkaline bicarbonates leave it colorless.

Silver bichromate paper turns yellow with free hydrochloric acid.

Besides these the author mentions a number of other papers less frequently needed. The use of all consists in letting a drop of the liquid in question fall upon a slip of the paper.

The author tests for arsenic (arsenious and arsenic acids) by means of slips of sheet brass, 2·5 to 3 centimetres in length and 15 to 17 centimetres in length. The hydrochloric solution is mixed with a little oxalic acid, or the ammonical solution is supersaturated with hydrochloric acid and mixed with oxalic acid in order to reduce arsenic to arsenious acid. A drop of the solution is put upon a brass plate and sharply dried; the place of the drop is then washed with water, when a dark spot of a permanganate color reveals the presence of arsenic. Dark thin outlines still appear in case of dilution with 150,000 parts.

In cases where the papers and the brass plate are not used the author places the two drops (of the reagent and the liquid in question) near each other upon a slip of glass and mixes them. The transparency of the glass renders the slightest turbidity visible.—*Pharmaceut. Central-Halle and Chemiker Zeitung; Chem. News*, July 4, 1884, p. 6.

THE VALUATION OF TARTAR EMETIC.[1]

By W. B. Hart.

The adulteration and consequent lessening of the valuable ingredient in drugs and dye-wares tends to develop methods of analysis, by which the commercial value of them may be rapidly determined, and thus the user and honest manufacturer be protected. Tartar emetic, whose value to the dyer depends solely on the amount of antimony it contains, has of late been lowered in quality, until in some cases it contains only about one-half the amount of metal that a good commercial sample should have. The usual method of estimating the antimony in this salt is by means of a standard solution of iodine, as recommended in most volumetrical analysis manuals. This method gives good results in careful and patient hands, but I find that it can be well replaced by a solution of calcic hypochlorite, or common bleach liquor, of a strength

[1] From the "Journal of the Society of Chemical Industry," May 29, 1884.

of about 2° Twaddell. The value of the hypochlorite can be found by using a standard solution of sodium arsenite. The sodium arsenite is the usual decinormal solution, made by dissolving 4·95 grams of pure arsenious acid in a solution of sodium carbonate, and when cool diluting to 1 litre. About 25 grams of sodium carbonate are required.

1 cc.=·00355 grams of Cl, or ·0061 grams Sb.

The usual potassic iodide and starch paper are needed. The process is conducted as follows: A weighed portion of the tartar emetic is dissolved, assisted by heat, cooled, and made alkaline with sodium carbonate. A known amount of the calcium hypochlorite solution is added in excess, this being shown by the blue color which a drop of the liquid gives to the starch paper. The excess of calcium hypochlorite is now found by titrating with the standard sodium arsenite, until the liquid ceases to give the blue color to the starch paper. The value of the hypochlorite added is found by taking an amount equal to that put to the tartar emetic, or an aliquot portion may be taken, making alkaline as before and titrating with standard arsenite, Penot's method. If an aliquot part is taken, the value of the whole is then to be calculated. The worth of the total hypochlorite added being known, and that of the excess also known, the amount of hypochlorite and therefore chlorine used to oxidize the antimony is thus obtained by difference. This also gives the amount of antimony. The reaction that takes place is as follows:—

$$Sb_2O_3 + 2Cl_2 + 4NaHO = Sb_2O_5 + 4NaCl + 2H_2O \quad \therefore 71\,Cl = 122\,Sb.$$

This process is rapid, and, for all practical purposes, accurate, the end of the reaction being sharp, and denoted at once, which with the iodine process is both tardy and tiresome.

The calcic hypochlorite solution, the value of which should be found at least once a day when required, must be kept in a stoppered bottle in a dark place, as it decomposes quickly if exposed to light and air. Even then it will not be of use long, but a fresh solution can easily be made.

The following are the results obtained by this process, along with those obtained by the iodine method, showing comparison:

	Iodine Process.	Chlorine Process.
No. 1. Mean of 3 trials.....	33.41 per cent, Sb.	33·29 per cent. Sb.
	37·048 " "	36·944 " "
No. 2.....	36·896 " "	36·820 " "
	37·000 " "	37·020 " "
	Mean 36·981 per cent. Sb.	36·928 per cent. Sb.

This method might be reduced to a comparative test only.

Let a standard sample of tartar emetic be procured in which the amount of antimony is known. Equal weights of the standard sample and of the sample to be tried are dissolved separately. From a Bink's or glass tap burette is added to the standard sample a solution of bleach liquor until the liquid just blues the aforesaid starch papers. The amount of bleach liquor used is noted. The second sample is treated in the same way. The relation of the antimony in the samples will be in the direct ratio of the volume of bleach liquor taken, and, therefore, in dyeing the amounts to be taken to produce a certain shade will be in the inverse ratio.

Example.—Equal weights of the standard sample (1), and of the second (2), were dissolved. No. 1 took 30 volumes of bleach liquor, and No. 2 took 20 volumes; then the ratio of the amount of antimony is as 3 to 2. Therefore, in practical work, for every two parts of the standard sample, three parts of the sample in question must be used and those give the same result.—*Pharm. Jour. and Trans.*, June 28, 1884, p. 1053.

NOTE ON KAMALA.

By William Kirkby, Ph.C.

Read before the Manchester Pharmaceutical Association.

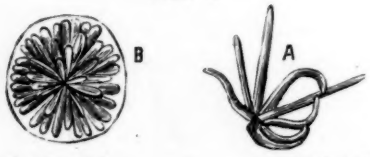
Kamala was not known in Europe as a drug until a very recent period. Before the year 1852 the only account of it is in the writings of Anslie, Roxburgh, Royle and Buchanan. In that year, however, Port-Surgeon Vaughan met with it in the bazaar of Aden under the Arabic name of *wars*. Specimens obtained by him were forwarded to Mr. Daniel Hanbury, together with information concerning the same. The following information collected by him is found in his "Notes on Drugs observed at Aden, Arabia:"[1] "*Wurrus* or *warus* is a red powder used chiefly as a dye. It is the produce of a plant resembling sesame. The plant rises to about 5 feet in height, bearing several separate bunches or clusters of small round seeds, which are covered with a description of flour; this, removed by gentle rubbing, constitutes the dye. Two kinds come into the market. The best comes from the interior, principally from the towns of Ó Badan and Gebla, and the districts of Yaffaee and Sjibul Rudfan. The second kind,

brought by the Somalis of the opposite coast, comes from Hurrer. The second quality is not so much valued, and does not realize the price of the kind which comes from the interior. A considerable quantity of the dye is exported to Bombay, being used at Surat by ladies for dyeing silk a light brown-yellow. The Arabs use it as a dye and as a medicine, internally, for leprosy, and externally, in solution, for freckles and pustules. Much of it finds its way to the Persian Gulf, being known as *asberg*." Dr. Vaughan goes on to say that the best quality sells for 24 rupees the maund, while the African variety sells for only 17 or 18 rupees the maund.

Mr. Hanbury[2] states that he showed the specimens he had received to Mr. Alexander Gibson, of Bombay, who was at that time in London. Mr. Gibson suggested to him that it was obtained from *Rottlera tinctoria*. He then proceeded to compare the drug with specimens in the museum of the Linnæan Society, and found that Mr. Gibson was correct in his surmise.

Kamala, as found in commerce, is a fine, mobile powder, of a dull red color. Under the microscope it is seen to consist chiefly of translucent, bright red granules mixed with colorless stellate hairs. These hairs give the drug its dull appearance. The glands, Fig. 1, *B*, are

FIG. 1.



B. Gland of genuine kamala. *A*. Stellate hair of the same.

spherical, rather irregularly so. Their diameter is from 70 to 120 mkm. (micromillimetres). They are flattened on one side, and are composed of a number of clavate cells enclosed in a pale yellow membrane. The cells are arranged in a radiate manner round a short stalk cell, which is not always visible, occupying the basal side of the gland. From ten to thirty of these cells may be seen on one side; the whole cell, however, contains from twenty to sixty of them. The cells are filled with a red resin, which is soluble in solution of caustic potash, alcohol and ether. On treatment with solution of caustic potash the structure of the gland becomes plainly visible. On appro-

[1] "Pharm. Journ." [1], xii, 385. [2] "Pharm. Journ." [1], xii, 589.

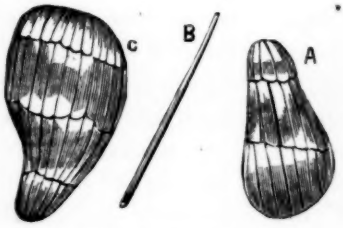
priate treatment, first with alcohol and afterwards with Schultz's solution of sulphuric acid and iodine, the cells are seen to be composed of cellulose, while the enclosing membrane is seen not to be cellulose.

Professor Flückiger[1] says that he examined authentic specimens from the Calcutta gardens. These were taken from *Mallotus phillipinensis* (*Rottlera tinctoria*), and he found them to agree entirely with the kamala of commerce.

From this it is plainly evident that the source of commercial kamala has been definitely settled.

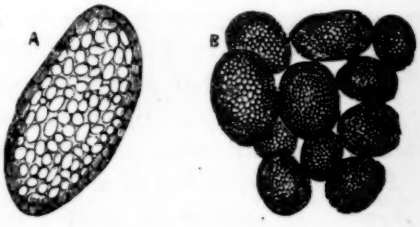
Some years ago Messrs. Allen and Hanbury imported a remarkable kind of this drug from Aden. A full account will be found in "Pharmacographia." Mr. Hanbury forwarded a sample of this to Professor Flückiger, who submitted it to an exhaustive examination.[2] It differs from the ordinary variety in bulk, in having a *dark* red or violet color. Microscopically examined, it is at once seen to have quite a distinct structure. Solution of caustic potash dissolves the resin contained by the glands and the general structure is easily seen. The glands are cylindrical, somewhat conical, and are composed, like the other, of resin cells enclosed by a membrane. The arrangement of the cells will be best understood by reference to Fig. 2. The glands

FIG. 2.



A. B. Glands of purple kamala.
B. Simple hair of same.

FIG. 3.



A. New (?) variety of kamala seen dry.
B. The same seen in solution of caustic potash.

are 170 to 200 mkm. long and from 70 to 100 mkm. broad. The hairs mixed with them are simple and long, when compared with the short stellate hairs of the common kind. Professor Flückiger is quite sure the two kinds are not obtained from the same plant.

Dr. Dymock, in his "Vegetable Materia Medica of Western India," says: "'*Wurs*,' or '*wurrus*,' which differs from genuine kamala in being a dark purple color, is the gland of the leaf of a leguminous

[1] "Pharm. Journ." [2], ix, 279. [2] "Pharm. Journ." [2], ix, 279.

plant, *Flemingia congesta.*" He was not able to ascertain if it is collected in India or whether it is imported from Arabia. I have not had the pleasure of seeing Dr. Dymock's book; but it was the note, as above, which appeared in "The Month" of a recent number of the "Pharmaceutical Journal," which first attracted my attention to kamala and its sources. Thinking it would be interesting to know if commercial kamala was entirely the produce of *M. phillipinensis*, I obtained samples of the drug from various parts of the country. I find that every one of the specimens obtained from dealers is genuine kamala.

Mr. E. M. Holmes, of the Pharmaceutical Society, has been kind enough to let me have samples of the specimens in the Society's museum. The results of my examination are as follows:

Sample marked "490 *b*," catalogued "Glands, covering fruit of *Rottlera tinctoria*," is genuine kamala.

Sample marked "490 *c*," catalogued "Wurrus, first quality," is identical with the purple variety examined by Professor Flückiger and is presumably the one referred by Dr. Dymock to *Flemingia congesta.*

Sample marked "490 *d*," catalogued "Wurrus, second quality." This is totally different from either of the other two varieties spoken of. I have been unable to find any record of a third kind of this drug. I therefore venture to put before you a short description of this specimen. The glands are from 50 to 170 mkm. long, and from 50 to 100 mkm. broad. When seen with the microscope in a dry state they are translucent and but faintly colored yellow. In form they vary very considerably; in fact, there appears to be no prevailing form. They impart but little color to ether, alcohol or solution of caustic potash. The cells are devoid of any such resin as is seen in the other two kinds. In solution of caustic potash they swell considerably, and their structure is rendered clearly visible. They consist of a mass of cells, composed of cellulose, enclosed by a non-cellulose membrane. The cells are not arranged in any particular manner. The general arrangement is shown, when seen in solution of potash, in Fig. 3, *B.* The hairs are similar to those found in the purple variety, being quite simple.

On drawing Mr. Holmes's attention to this unknown (?) variety, he informed me that he believed it was the *second* kind mentioned by Dr. Vaughan in his "Notes," and this sample was probably given by him to Mr. Hanbury, who presented it to the Museum.

I trust that some further information regarding the plants yielding the second and third varieties of "wurrus" will soon be forthcoming.

Looking at the last sort from an economic point of view, it would appear to be worthless as a dye, whatever it may be as a medicine.

In conclusion, I beg to tender my thanks to Mr. Holmes, and to Mr. Elborne who has assisted me in obtaining specimens of the drug. —*Phar. Jour. and Trans.*, May 10, 1884, p. 897.

WARAS.

By W. T. Thiselton Dyer, C. M. G., F. R. S.

Perhaps I may be allowed to add a few remarks to what is stated about "waras" in Mr. Kirkby's interesting paper in the *Pharmaceutical Journal*. The note contained in the inclosed copy of the "Kew Report" for 1880, p. 50, is, I believe, the origin of the identification of the plant producing the Aden drug with *Flemingia congesta*.[1]

[1] The following is the note referred to:

"*Waras.*—A drug known under this name appears to be exported in considerable quantity from Aden. It is used as a substitute for kamala, a well-known Indian product of *Mallotus philippinensis* (*Rottlera tinctoria* Roxb.). Its origin is quite unknown (see Flückiger and Hanbury, 'Pharmacographia,' pp. 575, 576). At the suggestion of the former, Captain Hunter, Assistant Resident at Aden, obtained specimens of the plant stated to yield waras in Arabia. He has also sent one to Kew with a note stating that it was gathered 'at an elevation of 6,000 feet on Jebel Dthubarah, 60 miles due north of Aden.' The plant sent was immediately identified with a leguminous species, *Flemingia congesta*, Roxb., having of course no affinity with *Mallotus philippinensis*.

"True kamala consists of the epidermal glands, detached by brushing from the fruits of the *Mallotus*. Alcohol extracts from it a splendid red color. The name 'waras' means saffron, and it may be mentioned in support of the notion that a similar substance is yielded in Arabia by perhaps one or more species of *Flemingia*, that dried specimens belonging to this genus stain paper in the herbarium a bright yellow color when washed over with the alcoholic solution of corrosive sublimate used to protect them from the attacks of insects. *Flemingia rhodocarpa*, Bak., from the Mozambique district has its pods covered with a bright red resinous pubescence.

"In the 'Pharmacographia' (2d ed., p. 372) Flückiger and Hanbury state that *Mallotus philippinensis* grows in Abyssinia and Southern Arabia. In a letter, Professor Flückiger doubts whether he and Mr. Hanbury were not mistaken in regard to this. The evidence of specimens in the Kew herbarium only carries the distribution to the west as far as Scinde. There is nothing improbable in its extending to Arabia, the flora of which is still so imperfectly known."

Professor Flückiger, with whom I had corresponded upon the subject, informed me (July 12, 1881) that though he at first objected to *Flemingia* as the source of "waras" he then thought the statement correct.

As the Kew Museum contained no satisfactory specimens of either African or Arabian "waras," we applied to the Resident at Aden to kindly assist us in procuring samples. These reached England in July of last year. In both cases the "waras" itself agreed microscopically with an authentic sample derived from Professor Flückiger, and had the structure figured by Mr. Kirkby. All three also exhibited the characteristic property of turning first bright red, then black, when carefully heated in small quantity on a glass slip over the flame of a spirit lamp.

The sample of Somali "waras" was mixed with seeds of a dull brown color mottled with black. These were found to agree precisely with the seeds of *Flemingia rhodocarpa*, Bak., from the Mozambique, which, as mentioned in the "Kew Report" (*l. c.*) "has its pods covered with a bright red resinous pubescence." A further scrutiny of the original specimen obtained by Captain Hunter from the neighborhood of Aden, which is in a rather immature state, led Professor Oliver to the conclusion that this also belonged to *Flemingia rhodocarpa*. I believe that the drug is derived from the young pods, and am disposed, therefore, to think that Dr. Dymock is in error in describing it as "the gland of the leaf."

I communicated these further facts to Professor Flückiger, and he wrote to me, October 4, 1883, "I am very much pleased with your statements, and can only say that I most fully agree with your conclusion as to the identity of the Somali "waras" with my original specimen and also that of the seed of *Flemingia rhodocarpa* with those met with in the said drug."

In the new "Official Guide to the Museums of Economic Botany at Kew" (No. 1, p. 45) we accordingly state that "waras . . . consists of the epidermic glands of the young pods of *Flemingia rhodocarpa*, Baker; native of Arabia and East Tropical Africa."

The third variety described by Mr. Kirkby is quite new to me, and I join with him in hoping that some further information about the plant yielding it will soon be forthcoming.

A further most interesting communication on the subject from Major F. M. Hunter, Assistant Resident at Aden, contained a memorandum

giving the complete history of the collection of the drug with a further specimen in fruit of the plant producing it, the pods bearing the epidermal glands still undetached. There can be now no sort of doubt that the "waras" plant is really that described by Mr. J. G. Baker, F. R. S., in the "Flora of Tropical Africa," as *Flemingia rhodocarpa.*

But my colleague, Professor Oliver, F. R. S., whose kindness is only equalled by his sagacity, has made the curious discovery that a *Flemingia* apparently confined to South India, *F. Grahamiana,* W. and A., is not specifically distinguishable from *F. rhodocarpa;* the pods are in fact clothed with the same peculiar epidermal glands so characteristic of that species. The "waras" plant is therefore really to be found in India after all.

In creating a new species for the "waras" plant, Mr. J. G. Baker pardonably neglected the comparison of the material he was working upon with specimens of the species occurring in so remote and botanically widely severed an area as the southern part of the Indian peninsula.

I trust that room may be found for Major Hunter's memorandum, which I append in its entirety.

Notes on "waras" collected at Harrar in February and March, 1884.

"In the neighborhood of the city 'waras' is not now raised from seed sown artificially, and it is left to nature to propagate the shrub in the surrounding terraced gardens. The plant springs up, among jowari, coffee, etc., in bushes scattered about at intervals of several yards more or less. When sown, as among the Gallas, it is planted before the rains in March. If the soil be fairly good a bush bears in about a year. After the berries [pods] have been plucked the shrub is cut down to within six inches of the ground. It springs up again after rain and bears a second time in about six months, and this process is repeated every second year until the tree dies. Rain destroys the berry [pod] for commercial purposes, it is therefore only gathered in the dry season ending about the middle of March. The bush grows to a maximum height of six feet, and it branches close to the ground. The growth is open and the foliage sparce. Each owner has a few acres of land.

"In the middle of February, 1884, the following processes were observed:

"The leaves [? fruiting shoots] of some plants were plucked and allowed to dry in the sun for three or four days. (The picking is not done carefully and a considerable quantity of the surrounding twigs, etc., is mixed with the berries [pods].) The collected mass was placed on a skin, heaped up to about six or eight inches high, and was tapped gently with a short stick about half an inch thick. After some time the pods were denuded of their outer covering of red powder which fell through the mass on to the skin. The upper portion of the heap was then cleared away and the residual reddish green powder was placed in a flat woven grass dish with a sloping rim of about an inch high. This receptacle was agitated gently and occasionally tapped with the fingers, the result being the subsidence of the red powder and the rising to the surface af the chaffy refuse, which latter was carefully worked aside to the edge of the dish and then removed by hand. This winnowing was continued until little remained but red powder. (No great pains are even taken to eliminate *all* foreign matter.) A rotl was sold in 1884 for about 13 piasters = 1 rupee 10 as. nearly.

"'Waras' is sent to Arabia, chiefly to Yemen and Hadhramaut, where it is used as a dye, a cosmetic, and a specific against cold. In order to use it, a small portion of the powder is placed in one palm and moistened with water, the hands are then rubbed smartly together, producing a lather of a bright gamboge color, which is applied as required."—*Pharm. Jour. and Trans.*, May 17, 1884, p. 917, and May 31, p. 969.

IODOFORM PLASTER.—Dr. Pope recommends the use of this plaster in cases of glandular enlargement, etc. In the cases in which he has tried it (*Wiener Medic. Blätter*) there was a marked diminution in the size of the tumor, or the amount of effused fluid, in what may be considered a short time, that is ten days. The formulas he uses are (1) Emplastrum iodoformi forte: 1 part iodoform to 2 parts emplast. adhesivum and emplast. plumbi (2) Emplast. iodoformi mite: 1 part iodoform to 6 parts of the plasters named. The plaster is spread on leather, and is left to remain *in situ* for six days. The strong preparation is recommended in glandular enlargements, etc. The weaker proves useful in the case of boils, minor injuries, etc.—*Medical Press and Circular; Louisv. Med. News*, April 26.

THE BITTER SUBSTANCE OF HOPS.[1]

By Dr. H. Bungener.

Little that is definite is known of the substances to which the hop owes its bitterness. Lermer has succeeded, it is true, in separating from hops a crystallized odorless substance, insoluble in water, an alkaline solution of which has a marked bitter flavor, and which easily changes on exposure to the air, assuming a resinous form. According to Lermer, the formula of this substance is $C_{32}H_{50}O_7$; it possesses the properties of a weak acid and forms a characteristic copper salt, which is soluble in ether. This hop bitter is, however, produced from the hop by a very roundabout process, by treatment of the extract with alkalies; it is not therefore regarded by many as present in this form in the hop, and they hold that it is only produced by the action of the alkalies. On the other hand, however, Etti, by a complicated extracting process, but without using an alkali, succeeded in producing a bitter substance from hops, which is, however, soluble in water.

Several experiments convinced me that there really existed in hops a crystallizable substance, insoluble in water, the alcoholic and alkaline solution of which had a bitter flavor, in short, which possessed all the properties of Lermer's hop-bitter acid. Petroleum ether is the best practical solvent in use for its isolation, as it does not dissolve the majority of the remaining constituents of the hop, especially the hop-resin, which they contain in considerable quantity. Still, the extraction of hop-bitter acid from hops is a troublesome and thankless job, the petroleum ether taking up certain substances which add greatly to the difficulty of purifying the crystals. On the other hand, we can readily and quickly attain our object, if we employ for our original material fresh lupulin from unsulphured hops.

The following process has furnished me the best results:

The lupulin is first freed from gross impurities (hop seed, leaves, etc.), and then covered with petroleum ether boiling at a low temperature (40° to 70°) in stoppered flasks. The mixture is shaken up from time to time. After twenty-four hours, by means of a Zulkowsky filter immersed in the mass, and with the aid of a suction pump, the dark brown solution is drawn off; then fresh ether is poured on to the lupulin and it is allowed to stand for another twenty-four hours. After this process has been three times repeated, nearly everything the

[1] "The Brewers' Guardian," from the "Zeit. f. d. gesammte Brauwesen."

petroleum will dissolve has probably been extracted. The solutions are put together and the petroleum ether distilled off *in vacuo* at a low temperature, until there remains in the flask a dark brown syrup, which on cooling solidifies into a crystalline mass. This is pulverized and turned on to a filter composed of a large funnel, in which a smaller funnel covered with muslin is inserted. With the aid of a suction pump, the greater portion of the thick, crude solution can be filtered through. There remains on the filter a highly colored crystalline "cake," which should be pulverized with a small quantity of petroleum ether and again filtered. After this operation has been repeated three or four times, we obtain an almost colorless mass, consisting of hop-bitter acid, contaminated by small quantities of a fatty substance and a substance which I could not isolate, and which I had at first great trouble in separating from the hop-bitter acid.

If we do not wish to utilize this crude substance at once it will be necessary to melt it in the water-bath and pour it into a bottle under close seal, where it will at once crystallize and solidify. If it remains exposed to the atmosphere it will soon become sticky and turn partly into resin. Six kilos of lupulin, which included a large proportion of sand, furnished 400 grams of crude hop-bitter acid. The first experiments in crystallization with petroleum ether gave poor results; it is difficult to produce the acid pure in large quantities by this process, as a small quantity of the above substance obstinately clings to it, and it readily assumes a non-crystallizable form. Our object is more readily attained if we crystallize it once from alcohol, for which purpose we dissolve it in a little lukewarm alcohol, then quickly cool the solution; flakes of a fatty substance will be separated, which are removed by filtration with the aid of a suction pump. Then we throw a few small crystals of the acid into the solution, and after a short time crystallization commences. As soon as it appears to be ended, the mother solution is removed with the aid of a platinum cone, and the crystals washed with a little cold alcohol. The alcoholic mother solution, which still contains the chief part of the bitter acid, must be quickly evaporated, and the residue consigned to a flask. The acid crystallized from the alcohol is then recrystallized several times from petroleum ether. In order to quickly dissolve the bitter substance, it should be carefully melted in a flask and double its volume of ether gradually added; on its cooling, we obtain beautiful prismatic crystals, which attain a length of 1 cm., and become perfectly pure after

four or five crystallizations. The mother solutions must be speedily evaporated if we still wish to obtain crystals; after a time they will only furnish a resinous residue.

The hop-bitter acid melts at 92° to 93°. It is easily soluble in alcohol, ether, benzol, chloroform, sulphide of carbon and vinegar; to a lesser extent in cold petroleum ether, and not at all in water.

In the analysis I obtained figures which correspond best with those calculated from the formula $C_{25}H_{35}O_4$.

	Calculated.	Obtained.					
		2. Crystal.		3. Crystal.	5. Crystal.		6. Crystal.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
C	75·19	74·79	74·83	74·9	75·04	75·05	75·07
H	8·77	8·97	8·90	8·85	8·87	8·83	8·80
O	16·04						

If we shake up the other solution of bitter substance with an aqueous solution of acetate of copper, the ether will assume a green color, and gradually deposits a green crystalline powder, a cupreous combination of the bitter acid. It is difficult to obtain in a pure state, as the solutions are already subject to slight decomposition, accompanied by a small deposit of copper oxide. This combination is readily soluble in alcohol, to a lesser extent in ether, and is insoluble in water.

In the course of analysis I obtained the following figures:

C	69·4	per cent.	69·3	per cent.
H	7·95	"	7·98	"
Cu	7·20	"	7·18	"

If we suppose that the copper combines with two molecules of hop-bitter acid, by the decomposition of one of its atoms, H, we obtain the formula $C_{50}H_{68}O_8$ Cu. This combination will contain 69·87 per cent. C, 7·91 per cent. H and 7·33 per cent. Cu. The figures obtained do not perfectly coincide with those calculated; it is nevertheless probable that the formula is correct, and the combined substance analyzed was not perfectly true.

I have already referred to the fact that solutions of hop-bitter acid, if left standing too long, assume a yellow color, and on evaporation leave only a yellow resinous residue. This, as its reaction shows, evinces a complete analogy with the crystallized acid. The dark colored mother solution, from which the crystalline cakes of bitter acid are obtained, contains a large proportion of this resinous compound,

which can be isolated by treatment with a weak soda-lye; this substance, like the crystallized acid, is soluble in alkalies, and can be precipitated from an alkaline solution by an acid. Old hops furnish far less crystallizable acid than new hops; from some samples I have been able to obtain only a few crystals; the remainder had been transformed into the resinous modification.

If pure hop-bitter acid be pulverized and exposed to the atmosphere it soon turns yellow and the surface assumes a resinous consistency. At the same time, a more pronounced odor of fatty acids and aldehydes is apparent. Still more rapidly will this oxidation occur if a thin layer of an alcoholic solution of the acid is allowed to evaporate in the air. On the other hand, we can allow hop oil to stand for days without its odor being perceptibly changed; it appears to me more than probable that the peculiar smell of old hops is due far more to the oxidation of the bitter substance than to the oxidation of oil.

Hop-bitter acid appears to possess the character of an aldehyde and of a weak acid; for the present I am not in a position to state its constituents more clearly. Most of the oxidizing processes have an energetic effect on it, forming also considerble quantities of valerianic acid.

The question as to whether the hop owes chiefly to this acid and its resinous modifications the property of imparting a pronounced bitter flavor to a solution, I must for the present leave unanswered. The acid and its isomer are both insoluble in water; they are, on the other hand, very readily dissolved in hop oil; they also furnish a tolerably bitter solution, if boiled for a long time in water, probably on account of their gradual decomposition. I will not for the present go further into the subject, as I hope soon to be in a position to give more definite information.—*Phar. Jour. and Trans.*, June 14, 1884, p. 1008.

Cider as a Preventive of Stone, is attracting attention in France. Dr. Dennis Dumont examined the records of the Caen Hospital, and found that in fifty-nine years only four cases of stone in the bladder were admitted. He attributes this immunity to the fact that the residents of the country are cider drinkers, which beverage is a decided diuretic. Enquiry showed that the residents of other cider-drinking districts enjoy the same immunity from stone.— *Weekly Med. Review.*

A NEW GLUCOSIDE FROM STRYCHNOS NUX-VOMICA.

By Wyndham R. Dunstan,
Assistant Lecturer in Chemistry and Physics to the Pharmaceutical Society and Demonstrator of Practical Chemistry in the School of Pharmacy;
and F. W. Short.
Assistant Demonstrator of Practical Chemistry in the School of Pharmacy.

FIRST NOTICE.

In the course of a complete chemical and botanical investigation of *Strychnos Nux-vomica*, with which we have been occupied for some time past (the results of which will shortly be published), a hitherto unnoticed constituent of the fruit has been discovered, and on further examination proved to be a new glucoside.

The body was first isolated from the pulp in which the seeds lie embedded within the fruit. This pulp has never received a full chemical examination. It was tested for strychnine by Hanbury ("Pharmacographia"), and the presence of this alkaloid definitely shown. In order to fully examine the constituents of nux-vomic pulp, it was dried and exhausted with that mixture of chloroform and alcohol (100 : 25) which we have previously shown to be the best and most suitable solvent for extracting the alkaloidal constituents from nux-vomica seeds. The exhaustion was effected in the apparatus for hot repercolation and continuous extraction devised by us and described in the "Pharmaceutical Journal," [3], xiii., 633. The chloroform-alcohol percolate as it cooled deposited crystals; these were separated and dissolved in alcohol and the solution spontaneously evaporated. In this way a mass of nearly colorless prismatic crystals was obtained. These crystals fused when strongly heated, then charred, and finally oxidized without leaving any ash; they contained no nitrogen, as was shown by their yielding no sodium cyanide when heated with metallic sodium. A larger quantity of pulp was next exhausted with chloroform and alcohol. The crystals deposited from the solution were thrice recrystallized from ordinary alcohol, and finally again from absolute alcohol. The perfectly colorless prismatic crystals thus obtained were analysed by combustion with lead chromate, when the following results were obtained:

	Found.		Calculated.	
	I.	II.	For $C_{25}H_{34}O_{14}$.	For $C_{25}H_{36}O_{14}$.
C.....	53·38	53·77	C..... 53·76	C..... 53·57
H.....	6·61	6·59	H..... 6.09	H..... 6·43
O.....	40·01	39·64	O..... 40·15	O..... 40·00
	100·00	100·00	100·00	100·00

It is seen from these results that the formula of the substance which we propose to call *loganin* (Loganiaceæ) is most probably $C_{25}H_{34}O_{14}$, although this formula will require confirmation in other ways, for these empirical results might also lead to the formula $C_{25}H_{36}O_{14}$. The first formula is that given to the glucoside arbutin (from *Arctostaphylos Uva-ursi* and *Pyrola umbellata*) by Hlasiwetz and Habermann (*Ann. Chem. Pharm.*, clxxvii., 339), although, according to Schiff, the substance analysed by these chemists was a mixture of arbutin ($C_{12}H_{16}O_7$.) and methyl arbutin ($C_{13}H_{18}O_7$). Habermann has since (*Monats. f. Chem.*, iv., 753) upheld the correctness of the original formula by further experimental results. But, be this as it may, the glucoside from *Strychnos Nux-vomica* is shown to be radically distinct from both arbutin and methyl arbutin, by a much higher melting point, and by not yielding quinol (hydroquinone) or methyl-quinol when acted on by diluted sulphuric acid.

The crystals of loganin lose no water when slowly heated from 100°—180°C. When further heated they liquefy at 215°C., this observation being made with the substance very gradually heated on the surface of mercury contained in a beaker, supported on a non-conductor in an air-bath—in fact, by a modification of the method for determining melting points originally suggested by Professor Redwood. This melting point was redetermined, using a capillary tube sealed at one end, into which the substance was introduced, the tube being slowly heated in a bath of glycerol (glycerin). It was noticed that the crystals softened at 200°C. and become transparently liquid at 215°C. Loganin is easily soluble in water and alcohol, less soluble in ether, chloroform and benzene. The aqueous solution is not precipitated by any of the alkaloid reagents, neither by lead acetate nor silver nitrate; further the solution is not affected by ferric chloride. Loganin develops no color when acted upon by nitric acid or other oxidizing agents, although it is powerfully oxidized by a mixture of sulphuric acid and potassium dichromate; bromine water is decolorized by a solution of the glucoside. The most characteristic

reaction of the substance is found in its behavior with concentrated sulphuric acid. A very small quantity of loganin, when gently warmed with a few drops of concentrated sulphuric acid, yields a fine red color, which, on standing, develops into a deep purple. An aqueous solution of loganin does not reduce Fehling's solution. When boiled with dilute sulphuric acid the glucoside is resolved into a glucose (reducing Fehling's solution) and a body which we propose to call *loganetin*. This substance, like loganin, gives the characteristic reaction with sulphuric acid although the purple color does not develop so rapidly. Loganetin is soluble in water and alcohol, less soluble in ether and chloroform. The aqueous solution of loganetin is not precipitated by silver nitrate or lead acetate, nor colored by ferric chloride. The substance gives no color when acted on by nitric acid. We are now engaged in a further study of loganetin.

From the amount of loganin obtained from the pulp on which we worked it appears to exist to the extent of from 4 to 5 per cent. in the dried material.

We now proceeded to examine the seeds of *Strychnos Nux-vomica* for the same glucoside, although its occurrence has never been noticed by other observers, nor does any mention of such a constituent appear in the original analysis of Pelletier and Caventou. About one hundred grains of the finely powdered seeds of *Strychnos Nux-vomica* were exhausted with boiling alcohol. The alcoholic solution was treated with tannin to precipitate alkaloid, and the excess of tannin was removed, together with coloring matter, by evaporating to dryness with lead hydrate. The dry residue was exhausted with absolute alcohol; this when evaporated left a small quantity of residue giving the characteristic purple color which loganin forms with sulphuric acid. The aqueous solution of the residue did not reduce Fehling's solution until it had been boiled with dilute sulphuric acid. In a second experiment the alcoholic solution of the seeds was evaporated to dryness, extracted with water, and the aqueous solution precipitated by lead oxyacetate. From the filtered liquid the alkaloid was nearly entirely precipitated by tannin. The solution after filtering was evaporated to dryness and extracted with chloroform. When the chloroform was evaporated, a residue was obtained which gave the reaction for loganin with sulphuric acid very distinctly. We have since found that the presence of loganin may be detected with great readiness in the alcoholic extract

of nux-vomica which is official in the British Pharmacopœia by extracting it with boiling ether, which removes also a little oil with a trace of alkaloid. The residue from the evaporation of the ethereal solution gives the reaction of loganin when gently warmed with sulphuric acid.

It has been shown in this preliminary note that the pulp of the fruit of *Strychnos Nux-vomica* contains to the extent of 4 or 5 per cent. a new glucoside which we have termed loganin, the chemical composition and properties of which have been described. It has also been shown that loganin is contained in small quantity in the seeds of *Strychnos Nux-vomica* and in the pharmaceutical preparations made from them. In the future we hope to be able to indicate the chemical constitution of loganin and loganetin and to discover the relations (if any) of these bodies to the alkaloids strychnine and brucine. The physiological action of loganin will also receive attention. The pulp of *Strychnos Nux-vomica* was collected and prepared for us through the kindness of Dr. W. C. Ondaatje, F.L.S., of Galle, Ceylon, to whose invaluable services in aiding this investigation we shall allude in a forthcoming paper. For this is the least of our obligations to him.—*Pharm. Journ. and Trans.*, June 21, 1884, p. 1025.

BOLIVIAN CINCHONA FORESTS.[1]

The great progress made in the acclimatization of cinchona trees in India, Ceylon, and elsewhere, has awakened the Governments of countries where the plants are indigenous to the necessity of conserving from reckless destruction, and re-planting denuded forests, so as to be able to keep up the supply of this valuable product.

In Bolivia, since 1878, according to the report of the Netherlands Consul, private individuals and land owners have taken up the question with great earnestness, and at the present time on the banks of the Mapiri, in the department of La Paz, there are over a million of young trees growing.

New plantations have also sprung up in various other localities, either on private ground or that owned by Government. The competition of India and Ceylon in supplying the markets, has had also the effect of inducing more care in collecting and also of revisiting old

[1] From the "Journal of the Society of Arts," June 13, 1884.

spots, often with the result of a rich harvest of bark which had been left on partly denuded trunks, and the opening up of new localities. The new shoots springing up from the old stumps have yielded much quill bark, and the root bark of the old stumps has also been utilized.

The re-planting entails very little expense. The Indian tenant on an estate has a house and land from the owner (hacienda) of the estate. For this he binds himself to work for two to four days a week, at from 28 to 36 cents per day, women and children obtaining 16 to 21 cents per day. Thus the planting, weeding, etc., during the first two years, is but nominal in expense; after this period the trees may be left to themselves.

On Government land the expense is greater, as after an application being made, the land is put up to public auction, and may fetch a very low or a higher price, according to the bidding. The land secured, contracts are made with natives of the lower class to clear the forest and plant cinchona. The contracts are often sublet to Indians. The young plants are planted from five to six feet apart, with banana trees between, on account of their rapid growth and the shade the latter afford. From March to June, after the wet season is over, is the best time for planting, and the contractor keeps the plantation free from weeds and in good order for twelve months, when it is handed over to the owner. The following is given as the cost of the Mapiri river plantation of an area from sixty or more miles in extent:—

	Dollars.
Ground	1,200
300,000 plants at 0·14 dollars	42,000
Superintendent, buildings, etc	4,400
Interest	4,800
Total	52,400

Till the plants are above two years of age, they are liable to die from drought or the attacks of ants, and during 1878 many thousands died from these causes. At the end of the fourth year some proprietors begin to collect the quill bark by the method of coppicing.

It is feared by some that should this new venture be successful, it will prove a dangerous rival to the plantations of India, Ceylon and Java, and lower the price of bark considerably.—*Pharm. Jour. and Trans.*, June 28, 1884, p. 1054.

INQUIRY INTO THE REDUCING ACTION OF VASELINE AND PARAFFIN ON PERMANGANATE OF POTASSIUM AND NITRATE OF SILVER WHEN CONTAINED IN PILLS.

By Geo. Smith, F. C. S.

Mr. Martindale suggested, in a letter to the "Pharmaceutical Journal" for January 13, 1883, the use of a mixture of vaseline, 2 parts, paraffin wax, 1 part, and kaolin, 3 parts, as a convenient and non-oxidizable excipient for making permanganate of potassium into pills. On January 28, 1883, some pills containing 2 grains of the salt in each, and 3 grains of the above excipient, were made by the writer, and coated at the same time with a solution of gum sandarac in absolute alcohol, as recommended by Mr. Martindale. Owing to other engagements their examination was not attempted till June 26th last.

The results obtained may be of interest to those who may have occasion to prescribe or dispense this remedy.

As a preliminary, on boiling one of the pills in a little distilled water, ample evidence of the presence of unreduced permanganate was obtained.

Three of the pills containing 6 grains of the salt (= ·3888 gram) were treated with distilled water (under 35°C.), until all soluble permanganate was extracted. The resulting cloudy solution was made up to 500 cc., and estimated with a volumetric solution of oxalic acid containing 6·3 grams per litre. A mean of three estimations made on 50 cc. at each time, proved that 70 per cent. of the permanganate originally present in the pills had been reduced.

It was observed that the sandarac coating reduced the permanganate as fast as it went into solution at first, and that only after the former was completely oxidized, did the characteristic deep reddish purple color of the permanganate begin to appear. Obviously this reduction was considerable, and to avoid it, the pills were carefully scraped, and the coating removed as completely as possible. One gram of the scraped mass (representing ·4 gram of the permanganate) was broken down and treated with successive portions of distilled water (under 35°C.) until all the soluble contents were removed, and the resulting solution allowed to settle in a beaker. When moderately clear, it was decanted and passed through glass-wool into a flask, the residues

washed, and the whole made up to 500 cc. Two series of estimations were made on 50 cc. and 100 cc. each of the solution. The following are the numbers obtained:

(*a*) 50 cc. required 6·7 cc. oxalic solution to complete decolorization.
(*b*) 50 cc. required 6·6 cc. oxalic solution to complete decolorization.
(*c*) 100 cc. required 13·7 cc. oxalic solution to complete decolorization.
(*d*) 100 cc. required 13·6 cc. oxalic solution to complete decolorization.

Mean = 13·53 cc. of volumetric solution of oxalic acid required to decolorize 100 cc. of permanganate solution.

Then 13·53 cc. × ·00314 = ·04248 $K_2Mn_2O_8$ (found) = 53·1 per cent.

The filtration through glass-wool did not entirely free the liquid from suspended manganic oxide. This interfered slightly with the accuracy of the readings. It is noteworthy that the *absence of the resinous coating* increases the percentage of unreduced permanganate from 30 to 53·1.

Estimation of Pills containing Silver Nitrate.—These pills, when examined, had been made eighty-five days. Two strengths were estimated (No. 1) containing 2 grains, and (No. 2) ½ grain each respectively of the salt. Both were made up to a total weight of 5 grains each by Mr. Martindale's excipient. They were *not coated.*

One gram of No. 1 (representing ·4 gram of silver nitrate) was carefully broken down under distilled water at the ordinary laboratory temperature (about 20°C.), by means of a glass rod. The silver nitrate entered readily into solution. The total liquid collected was allowed to settle, then filtered through glass-wool, the residue and wool being washed till free from traces of silver salt, and the solution made up to 500 cc. Some finely divided kaolin still remained suspended in the liquid. This prevented an accurate gravimetric determination. Instead, two series of separate volumetric estimations were made on 50 cc. and 150 cc. respectively, using a solution of ammonic thiocyanate (of which 1 cc. had been ascertained to equal ·0171 gram of commercial crystals of silver nitrate) with iron alum as indicator. The following are the numbers obtained:

(*a*) 50 cc. silver solution required 2·4 cc. NH_4CNS solution.
(*b*) 50 cc. silver solution required 2·35 cc. NH_4CNS solution.
(*c*) 150 cc. silver solution required 7·1 cc. NH_4CNS solution.
(*d*) 150 cc. silver solution required 7·05 cc. NH_4CNS solution.

Mean = 4·725 cc. NH_4CNS solution required to completely precipitate 100 cc. of silver nitrate solution.

Then 4·725 × ·0171 = ·08079 $AgNO_3$ (found) = 100·99 per cent.

The whole of No. 2 batch of pills was next estimated. One dozen were made, and it was considered desirable to estimate the *whole* of the silver nitrate *known to be contained in them* (= 6 grains = ·3888 gram), after the high results obtained by operating on a portion of No. 1. The *modus operandi* was the same as with No. 1, and the following are the figures obtained:

(*a*) 150 cc. silver solution required 6·75 cc. NH_4CNS solution.
(*b*) 150 cc. silver solution required 6·7 cc. NH_4CNS solution.
Mean = 4·483 cc. NH_4CNS solution to completely precipitate 100 cc. of silver nitrate solution.
Then $4·483 \times ·0171 = ·07666$ $AgNO_3$ (found) = 98·5 per cent.

These numbers require no comment, the high results obtained with No. 1 pills are probably owing to the imperfect mixing of the ingredients. Both numbers show conclusively that the paraffin excipient has no reducing action on nitrate of silver.

In conclusion, Professor Armstrong suggests that part of the reduction observed in the permanganate of potassium may be due to a contamination of the vaseline and paraffine wax with solid homologues of the olefine series (C_nH_{2n}). On the other hand the increase of over 23 per cent. of unreduced permanganate obtained when the influence of the sandarac coating is, as far as possible, eliminated, makes it desirable to continue the experiments further *on uncoated pills*, or *pills coated with melted paraffin mixture only*. The writer finds that pills coated with a mixture of white vaseline and paraffin wax can be sugar coated in the usual manner without much difficulty. In any case, the foregoing experiments prove that sandarac coating, or any organic resinous coating whatever, is inadmissible with pills containing permanganate of potassium.

Further experiments will be undertaken with permanganate, including, at the same time, trials with authentic specimens of terchloride of gold, and the double chloride of gold and sodium. If reduction should take place, and appear to arise from any impurity contained in the vaseline or paraffin wax, then a process may perhaps be devised to get rid of this drawback.

My thanks are due to Professor Armstrong, for kindly allowing this investigation to be carried out in the laboratory of the Technical College, Finsbury.—*Phar. Jour. and Trans.*, July 12, 1884, p. 21.

NOTE ON TU-TU (CORIARIA RUSCIFOLIÆ.)

By T. H. Hustwick.

The "tu-tu" plant (pronounced "toot," the final vowel in many Maori words being only an aspirate or lip sound is dropped by Europeans) is indigenous to New Zealand. It grows luxuriantly where situation is favorable, and prefers an exposed site on rising ground, with a dry friable soil; its average height, when mature, may be taken at about 5 feet, of a shrubby herbaceous character, and with its spreading branches covering a considerable extent of surface. Surrounded by sombre ferns and withered grasses, the effect of its glossy dark green foliage is very striking.

Tu-tu, though commonly spoken of as a poison, is such only under certain conditions, and even not then to all animals; the horse, goat, and pig being said to be entirely proof against it under all circumstances; while, conditions being favorable, cattle and sheep often fall victims to it. The season of its greatest activity is in spring; then, the wide spreading roots throw up numerous tender, succulent shoots, which are eaten with avidity by sheep fresh from the hills, where dry grasses and ferns have been the rule. Cattle browse on the young leaves, and when coming to them fresh from other pastures, or exhausted by labor or travel, nearly always with fatal effects. It is said that later in the year the poisonous property is greatly diminished; that even when most virulent its effects are much ameliorated by a previously full stomach, and that the system can become accustomed to it by gradual use. Animals suffering from the effects of this plant are said to be "tooted." Its principal action seems to be on the brain and nervous centres, and produces a condition similar to "staggers." The animal becomes stupid and lethargic, until roused into a fit of mad frenzy by any trivial circumstance, during which it is dangerous for man or beast to be in the way, the frenzy recurring at rapidly decreasing intervals, until death results in a few hours from sheer exhaustion. The only remedy that appears to be used is bleeding from the jugular vein, and that with very poor success, not one in ten being benefited, while the exceeding danger attending its use causes it to be practiced only under exceptional circumstances. I am not aware what is the effect of the green herb on man, but singularly enough the "berries" when ripe are grateful and refreshing to the thirsty palate, care being taken to reject the seeds. A common method of utilizing

the fruit is by tying a few bunches in a handkerchief and sucking the juice through it. Small birds are very partial to the ripe fruit and no injurious effect on them is apparent; most probably the seeds are voided by them entire. In the early days of the colony, when bullock labor was universal, whole teams were sometimes destroyed or disabled in a single night by this pernicious plant, rendering great care necessary in the choice of a camping place. The immunity enjoyed by the goat in respect of this plant was some years ago made use of on the Flaxbourne sheep run, a large number of these animals being procured for the especial purpose of securing its eradication. That an animal to whom the varied contents of a choice flower garden are a comestible delicacy should be proof against this particular plant is not to be wondered at, but why the plant should be so powerfully toxic as regards other ruminants is a matter for surprise.—*Phar. Jour. and Trans.*, July 12, 1884, p. 22.

THE NOMENCLATURE OF THE ALKALOIDS OF ATROPA BELLADONNA AND DATURA STRAMONIUM.[1]

By E. Schmidt.

The author having received several inquiries from physicians and others as to what substance was to be understood under the term "daturine,' and in what it differed from atropine, answers the question in this paper upon the basis of the investigations carried on by himself and by Ladenburg. He points out that in those investigations it was ascertained by different methods that the two alkaloids, atropine and hyoscyamine, are contained in *Atropa Belladonna* as well as in *Datura Stramonium*. The experiments of the author showed that in both plants the principal part of this alkaloidal mixture consists of atropine, having a melting point of 115° to 115·5°C., the quantity of hyoscyamine remaining in the mother liquor after the crystallization of the atropine being considerably smaller. According to the author's experience the yield of "daturine," which name is used to describe the basic mixture isolated from *Datura Stramonium*, varies very considerably according to the quality of the seed. For instance, four samples of thorn-apple seed from different sources yielded from 5 kilos respectively

[1] From the "Archiv der Pharmacie," xxii, 329.

12·5, 18·4, 2·6 and 10·2 grams of yellowish white crude "daturine." From 50 to 70 per cent. of this crude daturine consisted of pure atropine melting at 115° to 115·5°C. Moreover, a preparation of crude "daturine" received from Herr Trommsdorff, of Erfurt, from which a first crystallization had been removed, yielded still nearly 45 per cent. of pure atropine. Similar relations were also observed in the crude "atropine" from belladonna root. Ten grams of crude "atropine prepared by the author yielded in repeated spontaneous evaporation of its solution in alcohol between five and six grams of shining acicular crystals of atropine, melting at 115° to 115·5°C. Similarly ten grams of crude "atropine," supplied by Herr Trommsdorff, contained rather over six grams of pure atropine. It appeared probable that the mother-liquors still contained considerable quantities of atropine, probably hindered from crystallizing by the admixture of other bases, and in this respect no essential difference was observed between the mother-liquors of crude "atropine" and those of crude "daturine."

In the crude mixtures from belladonna root and thorn-apple seed examined by the author, and mostly prepared by him, the larger proportion of each sample consisted, as mentioned above, of atropine. The remaining and smaller portion, which was much more difficult to crystallize, consisted of hyoscyamine and probably other bases, and their decomposition products. The relative proportions would appear, however, not to be constant, otherwise it would be difficult to reconcile with this experience Ladenburg's statement that in *Datura Stramonium* he found the light alkaloid, hyoscyamine, to preponderate. The author mentions that under both the names "atropine" and "daturine" he has met in commerce with beautifully crystallized specimens of alkaloid that proved to be chemically and physically identical.

As therefore the investigation of Ladenburg does not, any more than that of the author, connect the name "daturine" with a particular chemical individuality, the author thinks it desirable, in order to avoid doubt and error, that this name should be dropped out from chemical literature and prices current, and that the alkaloids should be described by the names agreeing with their chemical characters. Consequently, leaving out of the question hyoscine, which Ladenburg found in the henbane together with hyoscyamine, Herr Schmidt would provisionally characterize only two plant bases having a mydriatic action: atropine, melting at 115° to 115·5°C., and hyoscyamine, melting at 108·5°C. Duboisine is, according to Ladenburg, in the pure condition, identical

with hyoscyamine, and the belladonnine of Hübschmann and of Kraut is probably a mixture of atropine with oxyatropine (Ladenburg and Roth). Should it be desired to differentiate between chemically identical atropine according to its origin, it would be simply to make a distinction between an atropine from *Atropa Belladonna* and one from *Datura Stramonium*, but not between atropine and daturine.—*Phar. Jour. and Trans.*, July 12, 1884, p. 29.

INDIA RUBBER AND GUTTA PERCHA CULTIVATION IN CEYLON.

From the Report of the Director of the Royal Botanic Gardens.

India Rubber.[1] *Ceara.*—In Ceylon a planted area of 977 acres is credited to this kind of rubber, but it has not yet appeared among our exports. Since it has been ascertained that the quality is excellent,[2] cultivators have been endeavoring to discover a means by which the milk can be obtained at a cost sufficiently low to give a return, but without, as yet, encouraging results. The removal of the outer separable bark, as practiced in the experiments referred to in my last report, has been objected to on the ground that the bark formed in its stead is of a different character, very hard and inseparable from the green layer a second time. Instruments have therefore been devised for bleeding without such removal. A knife with two parallel blades, which took out a strip of bark, has been modified into one in which the very sharp cutting edges meet to form a V, the basal angle during use being at the cambium. Another invention avoids all cutting, being a double spur-like wheel with sharp but guarded points which puncture the bark without further injury. The milking (one can scarcely call it tapping) has also been practiced on trees of various ages and at difierent intervals and seasons. While it is found that the yield of individual trees varies extremely,[3] none of the experimenters is satisfied that the small quantity obtainable by present methods is sufficient to make the cultivation profitable at the existing price of rubber. Mr. Wall, however, who states that hundreds of young trees have been bled *daily* with the "pricker" for some weeks, and that thus a cooly can collect about half a pound of dry rubber per diem, thinks that, if trees will bear this treatment for two hundred and forty days in the year, the cultivation would be remunerative. It appears evident that milking must be repeated at frequent intervals, and (as often already pointed out) the cultivation be

[1] The import of Caoutchouc into Great Britain during 1882 amounted to nearly 20,000,000 pounds.

[2] I am informed that as much as 4*s.* a pound has been obtained for Ceylon Ceara rubber.

[3] This is to be expected; for it should be recollected that the "milk" in plants is quite distinct from their sap, and is contained in special channels. It has no nutritive function, but, like the alkaloids in cinchona, is rather of the nature of an excretion. Its removal, therefore, *per se*, inflicts little or no injury on the plant.

conducted on a large scale. Much of the 35,000 acres in private hands in Ceylon, at present growing nothing but *Lantana* and other weeds, is suitable for this hardy plant, which costs nothing to cultivate, affords a substance of a value which is continually increasing, and awaits only the discovery of a process by which the latter can be cheaply and exhaustively extracted.

Castilloa Rubber.—From a single tree at Perádeniya a considerable crop of seedlings was raised. The fruits ripened at the end of May; they are little, white, pointed nuts, about half an inch long, covered by a bright orange pulp, and some twenty to thirty are crowded together on the fleshy flattened scaly receptacle, forming collectively what is called a compound fruit; about half of the fruits ripen and contain each a single seed. I have already expressed my opinion as to the suitability of this tree for cultivation by a Forest Department as a source of prospective revenue; and as comparatively few of the plants were disposed of to private persons, I made an endeavor to get plantations of this valuable tree formed at Ratnapura and Kalutara. The plan was sanctioned by the Governor, and I gave the necessary instructions; but after three months' delay it was discovered that the trifling sum necessary could not be provided.

The growth of the largest *Castilloa* tree at Henaratgoda is, at a yard from the ground, 30¼ inches, an increase of 4¼ inches during the year.

Para Rubber.—Nine trees flowered at Henaratgoda in March, and the fruit ripened in August. About two hundred and sixty seedling plants were raised, many of which have been disposed of to persons desirous to try the culivation. Our largest tree is now 30 inches in circumference, an increase of 4½ inches in the year.

Eighteen plants of another species of Hevea, *H. Spruceana*, were received from Kew in October. This is a native of British Guiana, where it is generally known by its Arawack name "Hatie." It has been studied in its native forests by Mr. Jenman, who sent us a plant in 1881, which unfortunately died. Dr. Spruce also collected it on the Amazons. It is closely allied to *H. brasiliensis*, and grows under quite similar conditions. The specimen of the rubber sent home by Mr. Jenman for report appears to have been unfortunately mixed with some impurity which prevented its value being accurately ascertained. The plants have been put out mostly at Henaratgoda, and are doing well.

Some seeds of this species were also kindly sent to the garden by the Manager of the Ceylon Company, Limited, in July, but were quite dead. It is useless to attempt to import seeds of this description from any distance, as they lose their vitality in a few days.

Other Rubber Plants.—*Landolphia Petersiana*, one of the East African rubbers, has flowered during the year, and *L. Kirkii* is now in bud at Henaratgoda. Two plants of *Tabernæmontana crassa* are now doing well. Among seeds received from Mr. L. Wray, of Perak, were some of "Gutta Singret," which appears from leaf specimens, also sent, to be a species of *Chilocarpus*, another climbing apocynaceous genus. Its rubber is not of a good quality, and is chiefly used for adulteration. A few plants were raised and are planted at Henaratgoda.

Gutta Percha.—A valuable series of dried herbarium specimens, of wood,

and of the commercial products of the various gutta-producing trees of Perak, has been sent by Mr. L. Wray, Jr. (collecting for Sir H. Low), which has enabled me to determine with more certainty the species we possess is a living state. He has also sent me a copy of a report to Sir H. Low on the gutta question, which contains some valuable additional matter to that collected at Kew and published in the report of that institution for 1881, pp. 38–47.

I am now satisfied that the identification of "Gutta Sundek" with *Payena* (*Ceratephorus*) *Leerii*, on which doubt has been thrown, is correct. Mr. Wray describes the tree as partial to swampy places near the coast, even where the water is salt; the wood is hard and close-grained, and the fruit sweet and eaten by the Malays. There is an inferior variety, with a thinner bark, known by its longer leaves. Our plants at Henaratgoda have grown quickly; their rate of growth is much more rapid than the species of *Dichopsis*—the largest are over 8 feet high; the tallest at Péradeniya is 6 feet 2 inches.

The young plants of "Gutta Taban putih" grow very slowly. The good dried specimens now sent show this to be distinct from *Dichopsis Gutta*, but I am not able to say to which species of *Dichopsis* they should be referred. This tree is found in the lower hills, 1,800 to 2,500 feet, and not in the plains; the gutta is a dirty white (whence the name putih = white), coagulates slowly, and does not thoroughly soften even in boiling water. Mr. Wray also distinguishes a small-leaved variety with a longer fruit.

The specimens further confirm our previous knowledge that the best and most frequent sort of gutta percha of commerce, "Gutta Taban merah," is the produce of *Dichopsis Gutta*. Our trees of this are now nine years old, but the tallest is but 9 feet high. According to Mr. Wray, this tree attains 100 to 200 feet in height, with a clean, straight trunk of 4 to 5 feet diameter, flanked at the base with large thin buttresses; the bark is ⅛ to ½ an inch thick, brown-red in color, and flakes off; the leaves are much narrower on young plants than old ones, the flowers are white, and the seeds yield an oil, solid at ordinary temperatures, but used for cooking. The gutta is at first white and cream-like, but becomes pink, and ultimately brownish red ("merah" = red), and this color is strongly imparted to the water in which it is washed. There is a variety of this species affording a paler gutta called "Gutta Taban sutra" ("sutra" = silk), which is found at a higher elevation (500 to 600 feet).

Other sapotaceous trees affording gutta, of which specimens have been sent by Mr. Wray, are "Gutta Taban simpoo," *Dichopsis Maingayi*, Clarke —the product of which is also sold as "gutta putih"—and "gutta garru," *Bassia Mottleyana*, De Vriese, which gives a white hard sort, only used for mixing with other kinds. He also sends examples of the curious substance called "Gutta Jelutong," used for adulterating gutta percha. It is obtained from a very lofty apocynaceous tree allied to our "Rukattana" (*Alstonia scholaris*),[1] and recently named *Dyera costulata* by Sir J. Hooker.

The yield of the gutta percha trees seems to be very small—less even than

[1] This appears to yield a somewhat similar substance at Singapore, called Gutta Pulei.

the rubber trees. Thus from a tree of *D. Gutta*, thought to be over one hundred years old, and over 100 feet high, Mr. Wray succeeded in extracting, by the ordinary native method, of felling and ringing the trunk and branches, only 2 lbs. 5 ozs. of clean gutta. Of "Gutta Taban putih," a tree 10 inches in diameter, gave 2 lbs. 11 ozs., and one of *Payena Leerii*, 2 feet 8 inches in circumference, only 6½ ozs. Mr. Wray has satisfied himself that only about $\frac{1}{3\,8}$ part of the gutta percha actually in the bark is extracted by this method, and he believes that by pounding and boiling the bark the whole could be obtained. As the question of the supply of gutta percha is becoming a pressing one, it is to be hoped that experiments on a large scale may confirm this opinion. To quote Sir J. Hooker ("Kew Report, 1881, p. 38), "the time cannot be far distant when the natural sources of gutta percha will be definitely used up." In view of this contingency it behoves the governments of those few British colonies—Ceylon being one—in which the trees will grow, to lose no time in establishing plantations, which must in the future become a valuable source of revenue. But in this colony, neither in this case nor in the case of india rubber, can anything be done until a proper forest conservancy is established.—*Phar. Jour. and Trans*, June 28, 1884, p. 1052.

MINUTES OF THE COLLEGE.

PHILADELPHIA, June 30, 1884.

The regular stated meeting of the Philadelphia College of Pharmacy was held this day at the College building, No. 145 North Tenth Street. Vice-President Charles Bullock in the chair. Thirteen members in attendance.

The minutes of the annual meeting in March last were read, and on motion adopted.

The minutes of the Board of Trustees for April, May and June were read by Thomas S. Wiegand, and on motion approved.

The Committee appointed at the last meeting to endeavor to prevail on those members who were reported by the Treasurer to be in arrears to pay up their dues, not being ready to report, was continued.

Mr. Pile, Chairman of the delegation appointed to attend the annual meeting of the Pennsylvania Pharmaceutical Association held in Wilkesbarre, Pa., made the following report:

The delegates chosen to attend the meetings of the Pennsylvania Pharmaceutical Association would respectfully offer the following report: The Association held its annual meeting at Wilkesbarre, on June 3 and 4, which proved to be one of the most entertaining and profitable that has been convened since its organization. The Association was welcomed by the Mayor of the city, Mr. Bodrick, who extended a cordial invitation to the members to visit the coal mines and other places of interest in the vicinity. President Duble delivered a very interesting address, after which the several reports of officers and committees were read. An election for officers to serve for the ensuing term was then held, and the following gentlemen

were declared elected: President, Chas. H. Cressler, Chambersburg; first Vice-President, Chas. T. George, M. D., Harrisburg; second Vice-President, Lawrence Wolff, M. D., Philadelphia; Treasurer, Jos. L. Lemberger, Lebanon; Secretary, J. A. Miller, M. D., Harrisburg. After the usual routine of business had been disposed of, the reading of answers to queries occupied the remainder of the several sessions, and all present were highly gratified at the remarkable success that attended the efforts of the Committee on Queries, whose Chairman, Mr. Alonzo Robbins, deserves great credit for his activity and perseverance in procuring so large a number of contributors. As many as twenty-eight papers were read and discussed, great interest being manifested in this part of the proceedings, the discussions at times being quite animated and instructive. Over eighty new members were proposed and elected, making a present membership of five hundred and three. Philadelphia and Erie were proposed as the place for the next meeting, and after some debate it was agreed to meet at Erie on the first Tuesday of June, 1885. The members were well entertained by the resident druggists and the Committee on Entertainments, and Mr. Kline, the chairman, is to be congratulated for the success of his efforts, which were highly appreciated by all who partook of the good things offered. A drive in carriages down the beautiful Wyoming Valley to the monument erected in memory of the soldiers who were massacred by the Indians in the early colonial-days, a concert and a ball, and last and best, a magnificent excursion on a gravity road over the mountains to Jones' Lake. These all added greatly to most enjoyable gathering of the Pharmacists of our great commonwealth.

All of which is respectfully submitted.

GUSTAVUS PILE, *Chairman.*

In response to the resolutions of the College, forwarded to the American Association for the Advancement of Science, the following letter was received.

June 26, 1884.

To the Philadelphia College of Pharmacy:

GENTLEMEN:—At a meeting of the Committee on Invitations and Receptions, held last Tuesday, June 24, the Hon. John Welsh laid before it your generous invitation to the scientific men who will participate in the meeting of the American Association next September. I am directed by the Committee on behalf of the local committee to express to the Philadelphia College of Pharmacy its sincere thanks for this courtesy to our foreign and American guests, and to say that your invitation will be officially presented to them at the earliest possible moment.

I have the honor to be,

Very respectfully,

PERSIFOR FRAZER.

TO MR. WM. J. JENKS,
Secretary Philadelphia College of Pharmacy.

The resignation of Henry Fisher as a member of the College was read, and on motion accepted.

The following members were elected delegates to the annual meeting of the American Pharmaceutical Association, which will meet in Milwaukee, Wisconsin, on Tuesday, August 26, 1884, with power to fill all vacancies which may occur in the delegation, viz.: Messrs. Alonzo Robbins, Philadelphia, Pa.; Chas. A. Heinitsh, Lancaster, Pa.; Geo. W. Kennedy, Pottsville, Pa.; Gustavus Pile, Philadelphia, Pa.; Prof. Joseph P. Remington, Philadelphia, Pa.

Then on motion adjourned.

WM. J. JENKS, *Secretary.*

EDITORIAL DEPARTMENT.

STATHMETIC ESTIMATION.—Mr. Alfred B. Taylor has called our attention to his article bearing the above title, as published in the Proceedings of the American Pharmaceutical Association, in which a sentence has been so changed by an omission, as to give an exactly opposite meaning to what was intended. On referring to the manuscript we observed that the mistake occurred by the compositor skipping one line. The sentence, which refers to "volumetric analysis," is printed on page 394 of the Proceedings, and should read as follows, by inserting the words printed in Italics: "The name does not appear to be exactly a proper one, since the process is used not for the purpose of ascertaining *the ingredients of a compound, but simply to determine* the quantity of some ingredient already known."

THE S. D. GROSS PROFESSORSHIP OF PATHOLOGICAL ANATOMY.—A movement has been inaugurated with the view of perpetuating with medical education the name of the eminent American surgeon who recently passed away, and a committee has been formed in Philadelphia, and an auxiliary committee by physicians and surgeons residing abroad, as well as in the different States of the Union. The following circular explains the object in view:

American Surgery has had no better exponent than Samuel D. Gross; none so honored abroad and at home by institutions of learning; none more revered by his associates and his pupils. His long and brilliant professorial career deserves the perpetuation of his name in close association with medical tuition.

In furtherance of this object, the Alumni Association of Jefferson Medical College has inaugurated a movement to secure, in some medical school, the endowment of a Memorial Professorship, to be designated "The S. D. Gross Professorship of Pathological Anatomy."

The profession at large, the personal friends of the late Professor Gross, and others interested in elevating the standard of medical education, are cordially invited by the undersigned to participate in this graceful recognition of conduct and services which have largely helped to establish the high standard of excellence to which Surgery has attained throughout the United States, and served so much to dignify the repute of American Medicine.

Contributions may be sent to Dr. R. J. Dunglison, Treasurer, Lock Box 1274, Philadelphia P. O., and will be acknowledged in the columns of the "Medical News" of Philadelphia.

D. HAYES AGNEW, M. D. *Chairman.*
J. M. BARTON, M. D., *Secretary.*

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

A Dictionary of the Action of Heat upon certain Metallic Salts, including an index to the principal literature upon the subject. Compiled and arranged by J. W. Baird, M.A., Ph.C. New York: Bermingham & Co. 1884.

This is a paper of about 70 pages which was contributed by Prof. Prescott to the "Journal of the American Chemical Society." The notes have been compiled from a large number of journals and standard works, involving very considerable labor, for the results of which those who may have occasion to consult the pamphlet, are indebted to the author and compiler.

The Electro-osteotome, a new instrument for the performance of the operation of ostiotomy. By Dr. Milton J. Roberts, Professor in the New York Post-graduate Medical School, etc.

Reprint from the "Medical Record."

OBITUARY.

WILLIAM WOOD STOCKTON, Ph.G., of Mount Holly, N. J., died at Huron, Dakota, April 23d, of nervous prostration, at the age of 30 years. He learned the drug business in Philadelphia with J. W. Smith, graduated from the Philadelphia College of Pharmacy in 1876, and at the time of his death had been engaged in business on his own account for about six months.

FRANK CONRATH, Ph.G., M. D., a native of Hesse-Darmstadt, came to this country at the age of eleven years, learned the drug business in Milwaukee, graduated in Philadelphia in 1875, afterwards studied medicine in Chicago, and graduated from Rush Medical College in 1880. For nearly two years he continued his studies in Berlin, Vienna and Prague, and in 1882 located in Milwaukee, soon obtaining an extensive practice. Inflammation of the lungs, which turned into acute consumption, terminated his useful career on May 15th last, at the age of 33 years.

JOHN S. GOODYEAR, Ph.G., a graduate of the class of 1837, died in Philadelphia, June 15th, aged 71 years. He was in business at Seventeenth and Pine streets upwards of 37 years.